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SUN TO SHINE 15 TRILLION YEARS

The interior of the sun must have a temperature of 70,000,000 degrees Fahrenheit, at the center, which gradually decreases until it is only about 10,000 degrees at the surface. That this is necessary to keep the sun at the size it is at present, and to prevent the gravitating mass of the outer part from collapsing to the center, is the opinion of Prof. A. S. Eddington, professor of astronomy at Cambridge University, stated in a series of lectures at King's College, of the University of London.

As a result of this conclusion, says Prof. Eddington, "no source of energy is of any avail unless it liberates heat in the deep interior of a star." This, he believes, effectually disposes of an idea, suggested in the past, that the sun received its energy from meteors which fell into it from outer space. "Clearly," he states, "you cannot maintain a temperature gradient by supplying heat at the bottom end. If this year the sun encountered a swarm of meteors which bombarded it with enough energy tofurnish a year's supply of radiation, that would not add a year, or even a day to the life of the sun; its internal readjustments would go on unaffected. All that would happen would be that the sun would give us twice the normal amount of radiation this year."

The theory once proposed that the sun is gradually contracting, and so releases the energy which forms the heat, is also untenable, says the astronomer, because with such a theory the sun cannot be more than 46,000,000 years old. "Physical and geological evidence seems to be conclusive," he says, "that the age of the earth - reckoned from a period which by no means goes back to its beginnings as a planet - is much greater. The age of the older rocks found from their uranium-lead ratio is generally put at 1,200,000,000 years; lower estimates have been urged by Prof. Joly, but none low enough to save the contraction hypothesis."

Astronomical facts also support these ideas of the age of the solar system, and so, says Prof. Eddington, "we seem to require a time-scale which will allow at least 10,000,000,000 years for the age of the sun; certainly we cannot abate our demands below 1,000,000,000 years."

"Since we cannot very well imagine an extraneous source of heat able to release itself at the center of the star, the idea of a star picking up its energy as it goes along seems to be definitely ruled out. It follows that the star contains hidden within it the energy which has to last the rest of its life. But energy cannot be successfully hidden; it betrays itself because it has (or because it is) mass. How much of the sum total of the energy of the sun is capable of being converted into radiation we do not know; but if it is all available, there is enough to maintain the

sun's radiation at the present rate for 15,000,000,000,000 years. To put the argument in another form, the heat emitted by the sun each year has a mass of 120,000,000,000,000 tons; and if this loss of mass continued there would be no mass left at the end of 15,000,000,000,000 years."

Since all theother alternatives are eliminated, Prof. Eddington supposes that the source of the energy must be in theprotons and electrons, charges of positive and negative electricity, of which the atoms are composed.

"We have to suppose," he says, "that a proton and electron run together, their electric charges cancel and nothing is left but a splash in the ether which spreads out as an electromagnetic wave carrying off the energy."

He admits the difficulty of some of these ideas, for apparently at a temperature of 70,000,000 degrees the energy is liberated so copiously that he asks, "can we suppose that energy issues freely from matter at 70,000,000 degrees as steam issues from water of 212 degrees? I think that physicists would be hard put to it to reconcile such extraordinary behavior with any accepted principles, yet that is what the astronomical observations taken at face value seems to insist."

In a reply to this suggestion, Prof. J. H. Jeans, president of the Royal Astronomical Society, denies that this can happen, for, he says, the transformation of matter to energy itself is a process which liberates noreheat, and, "as soon as the center of a star reached 70,000,000 degrees, the heat generated would raise the neighboring parts to 70,000,000 degrees, these would generate more heat, and so on, the high temperature spreading explosively throughout the star. The true analogy would be, not the issue of steam from water, but the explosion of a magazine of gunpowder."

ROCKEFELLER FOUNDATION LEADS WORLD FIGHT ON DISEASE

Over nine million dollars were spent during 1925 by the Rockefeller Foundation in its great campaign throughout the world to oust disease.

Hookworm, yellow fever and malaria are the enemies of mankind its International Health Board especially aims to annihilate. This organization follows the policy of working only through governments of the countries to which it lends aid and helps out only at the invitation of an official agency. It concerns itself only with new methods, one of its primary ends being to help a health official prove to his community the value of an innovation, but the board undertakes cooperation only with the clear understanding that theproject in hand is eventually to stand on its own financial feet.

In 18 different countries and in 220 counties in 26 different states in our country, the International Health Board backed up the local officials in their struggles with the hookworm problem with the result that nearly a million and a half people were treated. Around hookworm disease as a nucleus, the International Health Board has a general educational plan to instruct the populace of tropical and subtropical countries in sanitation andpreventive measures against all disease. This idea has spread to Europe and cooperation along these lines has been extended to

France, Austria, Poland and Czechoslovakia.

In 1925 only three cases of yellow fever occured in all the Americas, whereas formerly this disease made Central and South America and even New Orleans and other cities of the South, veritable pest holes. Now these same cities are represented to Northern tourists as health resorts with a fair degree of truth by their enterprising realtor citizens.

War on the yellow fever bearing mosquito has driven this former plague to a last stand in West Africa where experts sent out by the International Health Board, at the invitation of the countries concerned, are hard at work holding it in check lest it gain access to the Orient when the trans-African railways under construction are completed.

A new use for Paris green has been found in the contest with the malarial mosquito. Experience has shown that only by exterminating the insect that spreads the infection from person to person can malaria be stamped out since in the majority of cases patients will not continue doses of quinine long enough to be completely cured. Paris green has proved effective, cheap and safe as a means of eradicating the fever mosquitoes. In cooperation with the Italian government the International Health Board has been xperimenting with the arsenic compound in Calabria and Sardinia, sprinkling the breeding areas with a powder composed of 99 parts road dust and one part paris green. The samll quantity of poison killed the wigglers without harming the fish native to the waters, and mosquito breeding was stopped at very low cost.

Work on malaria was carried on in twelve states. in the United States, and in the West Indies, Brazil, Argentina, Palestine, the Philippine Islands, and Ceylon.

MINNOWS SENT TO AID ARGENTINE ANTI-MALARIA FIGHT

Two thousand minnows from the U. S. Bureau of Fisheries are enroute for Buenos Aires aboard the Argentinian battleship Moreno , to help stamp out malaria in the South American republic.

Top minnows are veracious feeders on the larvae of the mosquito carriers of the germ causing malarial fever. These larvae breed only in stagnant water and being air breathers stay almost entirely on the surface. Pools too large to have the air supply cut off by a film of oil have in many parts of this country been stocked with top minnows which have proved efficacious aids in keeping down the numbers of the anopheles mosquito.

The minnows now riding in state on the battleship have been sent from the Bureau of Fisheries at the request of the International Health Board to be used for breeding purposes and distributed throughout the malarial regions of Argentina to help in the campaign of that organization to rid the Americas of malaria and yellow fever.

RHYTHM IN INDIAN SONGS AID TO INDIAN MAGIC

How the strange rhythms of Indian music played a most important part in old Indian ceremonies and in treatment of the sick by medicine men is explained by Miss Frances Densmore, collaborator of the Bureau of American Ethnology.

In a paper presented to the twentieth International Congress of Americanists, which has just been received in this country, she points out the importance of rhythm in Indian music. The Indians learned many of their songs in dreams. The Indian put himself in a mental and physical state somewhat akin to self-hypnotism. He believed that this "dream" state would bring him supernatural experiences, and that songs were given in such dreams by supernatural entities commonly called "Spirits".

"In the dream, this supernatural entity promised the Indian aid in time of need," says Miss Densmore. "And this assistance was to be obtained by singing the song and performing certain acts. Thus, in the opinion of the Indian, a spirit communicated with him in a manner which was rhythmic, and he had the power to reestablish the communication and draw upon a source of supernatural power by repeating this rhythm in the form of his 'personal song'."

If the song was one for healing a disease, the Indian could use it to treat the sick. If a patient did not recover, it was supposed either that the diagnosis of the case was incorrect, or else thepatient was suffering from more than one disease. In the latter event, the second disease must be determined, and then a singer must be summoned who knew the proper songs for its cure. In all of this musical therapy the songs, with their strongly rhythmic quality, were regarded as vital in working the cure.

"The Indian did not consciously attribute the power to rhythm," says Miss Densmore. "He did not reason things out to that extent. He was, however, confident that the suggestion did the work, and from our study and general knowledge it appears probable that the rhythm was the principal power. The Indian singer knew it by a sort of primitive intuition, but cound not explain it.

"The importance of rhythm is shown by the fact that an Indian singer remembers the rhythm of a song more accurately than the melody, often repeating the rhythm with exactness, when changing the melodic progressions."

After transcription and analysis of more than 1350 Indian songs, representing music of thirteen tribes, this expert on Indian music concludes that peculiarity of rhythm is the chief racial characteristic of Indian music, and in the mind of the Indian it is closely associated with supernatural or mysterious power.

This intellectual use of rhythm by the Indian medicine men is quite different from the emotional use of rhythm by negroes, she points out, the negro rhythm being used for self-expression.

FRAME HOUSES SAFEST FROM TORNADOES

Brick and tile buildings are more susceptible to damage in tornadoes and cyclones than well built frame structures, Prof. C. C. Williams, head of the department of civil engineering at the University of Illinois, has learned, following a series of investigations.

Rooms of large size without the support of substantial interior walls are most readily collapsed in wind storms, he reports. Such large shell-like rooms to be safest from wind destruction should be located on the north andeast sides of buildings. A structure, in order to withstand storms, should have resistance to torsion and should be made of materialhaving high tensile strength.

In a report of his investigations he concludes:

"Frame and stucco dwellings with masonry basements may be built to sustain tornadoes at an additional cost of a small fraction of one per cent.

"Properly designed structures of brick, concrete, or steel may be expected to withstand terrific wind.

"Brick walls as ordinarily constructed are not stable against tornadoes because of their lack of tensile strength. The prevailing practice in the construction of brick buildings is not adequate to withstand severe storms.

"Large rooms in brick buildings should have steel roof trusses carried on independent steel columns.

"Corridors in school buildings should be built with solid construction walls up through the building and certain transverse walls should be made continuous as bracing for the building. Comparatively small square rooms with strong construction carried up through the building would act as "towers of strength" against such a storm.

"Reinforced concrete chimneys and bins ordinarily withstand tornadoes.

INDUSTRIES COOPERATE IN GOVERNMENT RESEARCH

Sixty-one research scientists, representing 36 organizations most of which are national in scope, are at work at the U. S. Bureau of Standards, helping to solve industrial problems.

The purpose of this cooperation, according to Dr. George K. Burgess, director of that bureau, is to make well-equipped laboratories available for the mutual benefit of government and governed, to bind the bureau and industry more closely together, to encourage the application of science to industry, and to add government prestige to research results.

This is a further development of the purpose for which the Bureau of Standards was created by Congress, Dr. Burgess said. Cooperation between industry and

government research is alsofostered by staff meetings, conventions, and national and international society meetings.

As the direct result of this closer union of science andindustry, more than $150,000,000 have been saved in the automotive industry alone, in brakelinings, tires and motor fuels. The steel industry is studying methods of treating and working iron and steel with gratifying results. The hosiery industry is one of those who maintain an associate research worker at the Bureau of Standards with a saving already of 28 millions.

FACE POWDER TWO THOUSAND YEARS OLD FOUND IN KOREA

The eternal flapper has existed in the Chinese Empire since the Christian era began. Two powder boxes dating back to the Han dynasty which held sway over China and Korea from 200 B. C. to 220 A. D. have just come to light in a grave near the city of Phong-yang in northeast Korea.

The archaeological remains found in the three graves at this site, according to reports received at the Peking National University, are expected to shed further light on the civilization of this period. The box which proved to be the most interesting of the objects unearthed was about a foot wide and contained a variety of smaller boxes and a curiously shaped flat cup whose function is unknown. There was however, no doubt about the vanity cases. There was the powder still in them and still white in spite of the passage of centuries.

PIE AND CAKE HAVE SCIENTIFIC APPROVAL

Pie is not so bad for the digestion.. Authority no less profound than the editors of the Journal of the American Medical Association sponsor this idea quoting "food specialists" to back up the contention.

Cake is coming into its own likewise, and bears the stamp of dietary approval as a real food. To refute the notion that it is "too rich" it is pointed out that it has only 25 per cent. more calories than bread, while a slice of the latter spread with butter is almost twice as rich in fat as the corresponding amount of chocolate cake.

A spider of tropical Asia glows like a firefly when alarmed.

Over 80 per cent. of the surface rocks in Yellowstone Park are volcanic.

AMERICAN CHESTNUT NOW NEAR EXTERMINATION

The problem of quickly using up in the next few years the chestnut trees growing on the 33,000,000 acres of south Appalachian woods is confronting the U. S. Forest Service and the forestry departments of the various states today. Dr. G. F. Gravat and R. P. Marshall, forest pathologists of the U. S. Department of Agriculture estimate that 80 per cent. of all the chestnut trees in more than half of the south Appalachian region will be blighted by 1930. By 1935 it is believed that nine-tenths of forest area will have passed that stage.

Because the lumber shortage is already being felt in the United States, owners of chestnut trees are urged by the department to utilize their timber before the rotting that follows the blight has caused heavy losses. Tests made by the U. S. Forest Products Laboratory have shown that the blight alone does not impair the strength or durability of the wood. But like a tree ringed with an axe, a blight-killed chestnut when left standing is soon rotted by the wood-decaying fungi that gain a foot hold in the dead tree.

The survey of the blighted area which was begun in 1924 and is still going on has shown that the fatal infection has now reached the southern limit of the commercial chestnut area. No practical control is known.

The organism that is killing the American chestnut by the wholesale, is a foreign fungus that was brought into this country on contaminated nursery stock from Asia a few years ago. In its native home the fungus was not as deadly as in America for the trees had acquired a sort of immunity. Many foreign varieties of chestnut are being imported now with the hope of finding a blight-resisting kind to replace the ones destroyed. While none have yet been found that are wholly immune a hairy Chinese variety and a Japanese chestnut have shown some natural resistance.

The American chestnut supplies half of the tanning extract used in this country in the manufacture of leather, and with the species facing extermination, a new economic problem must be met, it is stated.

MUSSOLINI HAS HYPOBULIA SAYS PSYCHIATRIST

The mind of Italy's dictator, Mussolini, was measured by psychiatric standards at the meeting of the American Psychiatric Association and was summed up in one word -- hypobulic. The mental analysis of Mussolini was made by Dr. Edward E. Mayer, well known psychiatrist of Pittsburgh, and was used in illustrating his remarks on hysteria.

Mussolini is not acting by reasoning will power, but by hypobulic will, he said. This type of will was defined as a blind sort of will that is not prevailed upon by persuasion or logical arguments.

"This hypobulic will exists in well persons as an essential and primary constituent of the will, linked with the purposive will to make the normal will," said Dr. Mayer.

In hysteric individuals, he explained, the two wills become separate and antagonistic factors in the personality. The hypobulic will attaches itself to an easily excitable group of ideas and is continually being brought by them into the foreground. When this false contact is loosened, the two types of will unite again, and the hysteria is cured.

Hysteria was described by Dr. Mayer as a turning away from actualities. The rational mind, finding some situations in life unsatisfactory, shifts the burden of its inefficiency to lower mental mechanisms.

"Mussolini is hypobulic," he said, "because he is playing like a hysteric with low-threshold stimuli to which he responds with all his being rather than to reasoning motivated conduct.

"Hypobulia exists as the predominant attribute of a strong personality, for it is not a weak-will at any time. The fanatical prohibitionist is an example of a hypobulic personality."

TOO MUCH INTELLIGENCE TESTING, SAYS CHILD EXPERT

"There is too much of a tendency to reduce human intelligence, human behavior, and human beings in general to mathematical quotients," declared Dr. H. W. Potter, who addressed the recent meeting of the American Psychiatric Association.

Dr. Potter deplored the tendency to brand troublesome individuals as mentally deficient merely because they grade low on formally administered mental tests.

"Such diagnosis may easily result in gross injustice and real harm," he said.

Apparent mental deficiency or backwardness may be due to many causes other than lack of intelligence, he pointed out:

"It is not uncommon to find a child more or less retarded in school who is reacting with some anti-social behavior because of emotional or temperamental instability, certain home situations that seem to perplex and worry him, troubles between his parents, or illness. He may have a glandular disorder which could seriously affect his mental condition. Mental retardation may come as an aftermath to sleeping sickness.

"It is absolutely necessary to probe into all of these factors, before the diagnosis of mental defect can be made with certainty. Once such difficulties are cleared up, the backward child may be found to be endowed with normal intelligence, or indeed, possibly superior intelligence."

Aniline dye solutions have power to stop growth of bacteria.

OPEN AIR HAS BETTER ACOUSTICS THAN BEST AUDITORIUM

A speaker may be heard more clearly and accurately in the open air than in any auditorium. This conclusion, following elaborate experimentation by Dr. Vern O. Knudson, physicist in the University of California, Southern Branch, is a contradiction of the widespread idea that a properly constructed auditorium reinforces and improves audibility. The walls of such a room may increase the general loudness of speech-sounds, but the interference of reverberation more than counteracts the presumed advantage. In one test of an auditor's accuracy in understanding speech it was found that a listener 100 feet from a speaker in theopen-air Hollywood Bowl made a better record than he could even in the best Los Angeles auditorium available.

More precise tests were carried on with the aid of an oscillating amplifier - the equivalent of a "howling" radio set. This device yielded a sound electrically controlled and maintained at a set value just 1000 times the amplitude of a barely audible sound. The "howl", suddenly interrupted, reverberated for five seconds in a test room with a cement floor and no furniture. When a set of meaningless speechsounds was spoken in this room, the auditor got only 50 per cent. of them correctly.

The room was now gradually padded more and more completely, as time went on, with a one-inch layer of hair-felt. Reverberation was steadily shortened. Finally with maximum padding, 92 per cent, accuracy in speech understanding was attained, while the reverberation time had shrunk to six-tenths of a second. This is considered the limit in acoustic clearness indoors; but when the experimenters moved outdoors the accuracy rose to 95.7 per cent. exceeding the best record of a padded room and much ahead of any regular auditorium. Higher accuracy than 95.7 is improbable, as the auditors make a few mistakes in any case. These occur with end consonants, especially "th" and "ng", and not with vowel sounds.

Concave sounding boards located back of a rostrum are considered by Dr. Knudson of appreciable acoustic value, but are generally architectural misfits. Auditorium walls in any common position are simply a necessary nuisance. Music halls, where clearness of speech articulation is of minor concern, are not directly considered in the work described; nor is any account taken of peculiar halls where a rear-seat auditor can hear a pin drop on the stage. Such a stunt may have no relation to the value of the auditorium for continuous speech.

The moral of all this to the architect seems to be - break the rules of scientific acoustics if you have to in order to avoid spoiling an artistic design; then spend some money on padding. In view of the expense and other disadvantages of hair-felt, the field is now open for a porous, spongy wallplaster which may absorb more of the stray sound than common hard plaster, and thus prevent reverberation.

TABLOID BOOK REVIEW

THE GOSPEL OF EVOLUTION. By J. Arthur Thomson. New York: G.P.Putnam's Sons.1926

The word "Gospel", Greek scholars tell us, translates literally into the English word "news", but with the connotation that it is good news. The original doctrine of the mild and tentative Darwin was seized upon and Prussianized during the latter part of the nineteenth century by a lot of fierce North Germans, so that it is not remarkable that timid and not too well-informed souls like the late Mr. Bryan should have

become convinced that it was bad news. Much is being done now to undo the disservice of evolution's earlier camp-followers, and of the new commentators on the true gospel one of the worthiest is J. Arthur Thomson. His already well-known gifts of lucidity in popular presentation of scientific facts and genial humanism in commenting on them are sufficient bush for the wine of this new book.

OUTLINE OF CHRISTIANITY. The Story of Our Civilization. In five volumes. Volumes 1, 2 and 3 published. New York: Dodd, Mead and Company.

This is an age of "outlines", that is of comprehensive surveys that aim to bring together the results of the highly specialized researches of previous decades in history and science. In no field is such a synthesis more needed than in religion where diversity of aspects and sectarian distinctions conceal the inner unity and course of development.

This stupendous work has been carried out under the auspices of editorial and advisory boards numbering over a hundred, and including scholars in all fields and representatives of all the branches of Christian faith. Yet the management of many minds has not resulted in nullification of opinion or tameness of style.

The narrative sticks close to the facts of history as revealed by modern scholarship, and varying views on vexed questions are presented fairly and treated tolerantly. It is informative rather than polemical, and constructive rather than critical. Its scholarly substructure is skilfully concealed, and in most of the chapters the style runs smoothly. It is handsomely illustrated. The first volume deals with the life of Christ and with his followers of the first century. The second describes the growth of the Catholic Church and its external and internal antagonists during fifteen hundred years. The third deals with the Reformation and the various denominations arising out of it. The fourth volume will discuss the relation of Christianity to science andother forms of modern thought, and the fifth will show how Christianity aims to solve the vital problems of today and tomorrow.

It is useless to say that this "Outline of Christianity" is the best book of its kind, because it is the only book of its kind. It summarizes the information that every thoughtful person needs to know, whatever may be his personal religious faith.

EDWIN E. SLOSSON

MANUAL OF INJURIOUS INSECTS. By Glenn W. Herrick. New York: Henry Holt and Company. 1926. $4.50.

Students of agriculture and horticulture and workers in the experiment stations will find this a most useful volume to have about; it is, indeed, excellently adapted as a text for some courses. The treatment is concise and straightforward, and the illustrations accurate and very well done. In addition to the main discussion of crop and orchard pests, there are also adequate treatments of household pests, methods of insect control, and insects useful to man.